

1,041,028



## PATENT SPECIFICATION

NO DRAWINGS

1,041,028

Inventors: ALAN HAYES and JOHN FREDERICK RYLEY

Date of filing Complete Specification: Dec. 3, 1964.

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Int. Cl.:—A 61 k 3/00 // C 07 d

## COMPLETE SPECIFICATION

## Veterinary Compositions comprising Paraquat Salts

CHEMICAL INDUSTRIES LIMITED of Imperial Chemical House,  
do hereby declare the invention, for

5

## ERRATA

SPECIFICATION No. 1,041,028  
Amendment No. 1

Page 2, line 36, for "thay" read "they"  
Page 3, line 17, for "thay" read "they"  
Page 5, line 30, for "solutoin" read "solution"  
Page 7, line 6, for "mag-" read "magnesium sulphate."  
Page 7, line 8, after "16—21" delete "nesium sulphate"

THE PATENT OFFICE  
14th October 1966

15

wherein R and R<sup>1</sup>, which may be the same or different, stand for alkyl radicals having more than 4 carbon atoms or for carboxymethyl radicals, and X stands for an anionic radical, in the presence of a wetting agent and/or a humectant. The only anionic radicals disclosed in this specification are the chloride, bromide, iodide, methosulphate and ethosulphate anions.

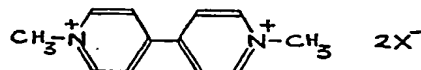
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Thus, it is known that certain di-quaternary salts of 4,4'-dipyridyl, for example paraquat di-iodide, are valuable herbicidal agents. We have now made the surprising discovery that compounds of this type also possess anticoccidial activity.

20

According to the invention we provide veterinary compositions comprising one or more pyridine derivatives of the formula:—



25

wherein X<sup>-</sup> stands for an anion, together with an inert non-toxic diluent or carrier.

25

As a suitable value for X<sup>-</sup> there may be mentioned, for example, a halide anion, for example the chloride, bromide or iodide anion, or the methosulphate anion. Alternatively, X<sup>-</sup> may stand for an anion derived from an anticoccidial sulphonamide derivative, for example sulphadimidine, sulphadiazine, sulphapyridine, sulphathiazole, sulphanilamide, sulphaquinoxaline or N - 4' - acetylaminobenzene - sulphonyl - 4-nitroaniline. X<sup>-</sup> preferably stands for the anion derived from sulphadimidine.

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As one valuable embodiment of the invention there may be mentioned, for example,

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Price 75p

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L041028

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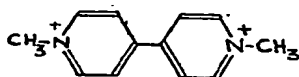
## COMPLETE SPECIFICATION

## Veterinary Compositions comprising Paraquat Salts

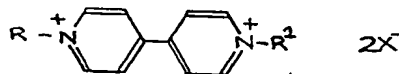
We, IMPERIAL CHEMICAL INDUSTRIES LIMITED of Imperial Chemical House, Millbank, London, S.W.1, a British Company do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to veterinary compositions, and more particularly it relates to veterinary compositions for the treatment of coccidiosis.

It is to be understood that in this specification the term 'paraquat' stands for the cation of the formula:—



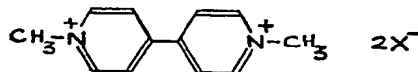
In the United Kingdom Patent Specification No. 813,531 there are described and claimed *inter alia* aqueous herbicidal compositions comprising as active ingredient at least one compound of the formula:—



wherein R and R<sup>1</sup>, which may be the same or different, stand for alkyl radicals of not more than 4 carbon atoms or for carboxymethyl radicals, and X stands for an anionic radical, in the presence of a wetting agent and/or a humectant. The only anionic radicals disclosed in this specification are the chloride, bromide, iodide, methosulphate and ethosulphate anions.

Thus, it is known that certain di-quaternary salts of 4,4'-dipyridyl, for example paraquat di-iodide, are valuable herbicidal agents. We have now made the surprising discovery that compounds of this type also possess anticoccidial activity.

According to the invention we provide veterinary compositions comprising one or more pyridine derivatives of the formula:—



wherein X<sup>−</sup> stands for an anion, together with an inert non-toxic diluent or carrier.

As a suitable value for X<sup>−</sup> there may be mentioned, for example, a halide anion, for example the chloride, bromide or iodide anion, or the methosulphate anion. Alternatively, X<sup>−</sup> may stand for an anion derived from an anticoccidial sulphonamide derivative, for example sulphadimidine, sulphadiazine, sulphapyridine, sulphathiazole, sulphanilamide, sulphaquinoxaline or N - 4' - acetylamino benzene - sulphonyl - 4-nitroaniline. X<sup>−</sup> preferably stands for the anion derived from sulphadimidine.

As one valuable embodiment of the invention there may be mentioned, for example,

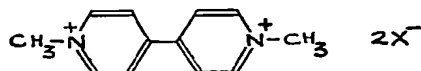
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Price 75p

pre-mix compositions or medicated animal foodstuffs containing as anticoccidial agent one or more of those of the said pyridine derivatives wherein  $X^-$  stands for an anion derived from an anticoccidial sulphonamide derivative. These compositions may contain any of the appropriate diluents or carriers described hereinafter. The pre-mix compositions may contain between 5 and 70% w/w of the anticoccidial agent, and the medicated foodstuffs may contain between 0.01 and 0.1% w/w of the anticoccidial agent.

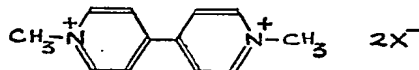
We have also found that compositions comprising one or more of the abovementioned pyridine derivatives and one or more known anticoccidial agents are particularly valuable for the prophylactic and curative treatment of coccidiosis. As suitable known anticoccidial agents there may be mentioned, for example, known anticoccidial sulphonamides and salts thereof, for example sulphadimidine, sulphadiazine, sulphapyridine, sulphathiazole, sulphanilamide, sulphaquinoxaline or *N* - 4' - acetylaminobenzenesulphonyl - 4 - nitroaniline, and salts thereof, for example an alkali metal salt, for example the sodium or potassium salt, or an alkaline earth metal salt, for example, the calcium or barium salt, or the ammonium salt. As other suitable known anticoccidial agents there may be mentioned, for example, 3,5 - dinitrobenzamide, 2 - methyl - 3,5 - dinitrobenzamide and amprolium. We have found that mixtures comprising one or more of the above-mentioned pyridine derivatives and one or more known anticoccidial sulphonamides or salts thereof, for example sulphadimidine or a salt thereof, are particularly valuable because of their particularly good therapeutic ratio.

According to a further feature of the invention, therefore, we provide new compositions of matter consisting of one or more pyridine derivatives of the formula: —



wherein  $X^-$  stands for an anion, and one or more known anticoccidial agents.

According to yet a further feature of the invention we provide veterinary compositions comprising one or more pyridine derivatives of the formula: —



wherein  $X^-$  stands for an anion, and one or more known anticoccidial agents, and an inert non-toxic diluent or carrier.

The veterinary compositions of the invention may, for example, be in the form of aqueous solutions, solution tablets, pre-mix compositions or medicated foodstuffs.

The aqueous solutions of the invention include, for example, concentrated aqueous solutions as defined hereinafter which can be added to the drinking water of infected chickens. The aqueous solutions preferably contain a salt of a known anticoccidial sulphonamide derivative, for example an alkali metal salt of sulphadimidine, and they may contain conventional excipients, for example a humectant and/or colouring agent. The aqueous solutions may be stored or used in metal containers, and in this case they may contain one or more corrosion inhibitors, for example sodium nitrite and/or sodium metaborate.

The solution tablets of the invention may, for example, be added to the drinking water of infected chickens. These tablets preferably contain a salt of a known anticoccidial sulphonamide derivative, for example an alkali metal salt, and they may contain one or more conventional excipients, for example disintegrating agents, for example starch and vegetable gums, lubricating agents, for example magnesium stearate, and inert fillers, for example lactose and magnesium sulphate.

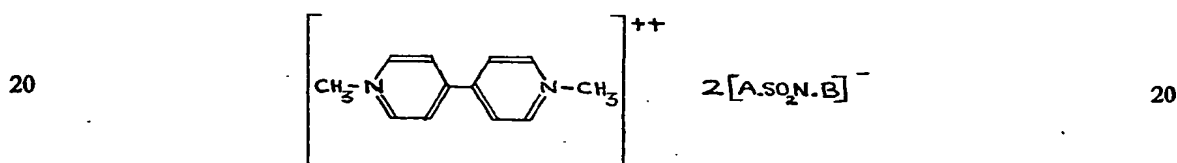
The drinking water of infected chickens should generally contain between 0.001 and 0.02% w/w of paraquat and between 0.005 and 0.1% w/w of the anticoccidial sulphonamide derivative(s). The said concentrated aqueous solutions contain between 0.5 and 7.5% w/w of paraquat and between 1.0 and 15% w/w of the anticoccidial sulphonamide derivative(s) or salt(s) thereof. The solution tablets may contain, for example, between 0.5 and 30% w/w of paraquat and between 1.0 and 60% w/w of the anticoccidial sulphonamide derivative(s) or salt(s) thereof.

The pre-mix compositions of the invention may contain the active ingredients in admixture with a solid non-toxic diluent or carrier, for example ground corn, corn distiller's dry grain, wheat shorts, corn cob meal, kaolin, talc, fuller's earth, calcium carbonate, attapulugus clay or ground oyster shells. The pre-mix compositions are formulated so as to be suitable for dilution with an animal foodstuff so as to provide a medicated animal foodstuff.

The pre-mix compositions of the invention may contain, for example, between 2 and 20% w/w of paraquat and between 6 and 60% w/w of the anticoccidial sulphonamide derivative(s) or salt(s) thereof. The medicated poultry foodstuffs of the invention, which are particularly useful for the prophylactic control of coccidiosis, may contain, for example, between 0.002 and 0.02% w/w of paraquat and between 0.006 and 0.06% w/w of the anticoccidial sulphonamide derivative(s) or salt(s) thereof.

This invention also relates to new anticoccidial compounds which are salts comprising paraquat and two monovalent anions derived from an anticoccidial sulphonamide derivative. By virtue of the anticoccidial activity of the cationic moiety, these new salts have a greater anticoccidial activity than that afforded by the anionic moiety alone, and they also have a good therapeutic ratio.

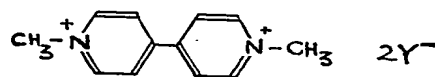
According to a further feature of the invention, therefore, we provide anticoccidial salts of the formula: —



wherein the anion  $[\text{A}.\text{SO}_2\text{N}.\text{B}]^-$  stands for the anion of an anticoccidial sulphonamide derivative.

Any known anticoccidial sulphonamide derivative may be used in the preparation of the anticoccidial salts of the invention, and as suitable anticoccidial sulphonamide derivatives there may be mentioned, for example, sulphadimidine, sulphaquinoxaline, sulphathiazole and *N* - 4' - acetylamino benzenesulphonyl - 4 - nitroaniline. The salts of the invention derived from these specific sulphonamide derivatives are respectively the paraquat salt of sulphadimidine, the paraquat salt of sulphaquinoxaline, the paraquat salt of sulphathiazole, and the paraquat salt of *N* - 4' - acetylamino benzenesulphonyl - 4 - nitroaniline.

According to a further feature of the invention we provide a process for the manufacture of the anticoccidial salts of the invention, which comprises the interaction of a compound of the formula: —



wherein  $\text{Y}^-$  stands for an anion, but excluding anions derived from sulphonamide derivatives, with a salt of an anticoccidial sulphonamide derivative, but excluding paraquat salts thereof.

As a suitable value for  $\text{Y}^-$  there may be mentioned, for example a halide, anion, for example the chloride, bromide or iodide anion, or the methosulphate anion. As a suitable salt of the anticoccidial sulphonamide derivative there may be mentioned, for example, an alkali metal salt, for example the sodium or potassium salt. The interaction may conveniently be carried out in an inert diluent or solvent, for example water.

The invention is illustrated but not limited by the following Examples in which the parts are by weight: —

#### EXAMPLE 1

56 Parts of the paraquat salt of sulphaquinoxaline and 44 parts of ground corn are thoroughly mixed in a blending machine. There is thus obtained a pre-mix which can be mixed in suitable proportions with poultry foodstuffs. The medicated poultry foodstuffs thus obtained are suitable for feeding to poultry for the prophylactic control of coccidiosis.

The above procedure is repeated except that the ground corn is replaced by corn distiller's dry grain, wheat shorts, corn cob meal, kaolin, talc, fuller's earth, calcium

carbonate, attapulgius clay or ground oyster shells, and there are likewise obtained pre-mixes which can be mixed in suitable proportions with poultry foodstuffs to give medicated poultry foodstuffs which are suitable for the prophylactic control of coccidiosis.

#### EXAMPLE 2

5       The procedure described in Example 1 is repeated except that the 56 parts of the paraquat salt of sulphaquinoxaline are replaced by 56 parts of the paraquat salt of sulphadimidine. The medicated poultry foodstuffs thus obtained are suitable for feeding to poultry for the prophylactic control of coccidiosis. 5

#### EXAMPLE 3

10       To a mixture of 30 parts of paraquat di-iodide are added 70 parts of dried magnesium sulphate (magnesium sulphate trihydrate). The resulting solid is sieved and granulated, and the granules are thoroughly mixed together with 1 part of magnesium stearate. The granules are then compressed into tablets. One of these tablets containing 0.23 part of paraquat di-iodide dissolved in 1000 parts of water affords a medicated 15  
drinking water which is useful in the treatment of outbreaks of coccidiosis. 15

#### EXAMPLE 4

20       A solution of 0.47 part of paraquat dichloride, 0.063 part of sodium nitrite and 0.019 part of sodium metaborate in 1.7 parts of water is added to a solution of 1.6 parts of the sodium salt of sulphadimidine in 50 parts of water. The resulting solution is made up to 100 parts with water, and there is thus obtained a concentrated aqueous solution which is suitable for the preparation of medicated drinking water. 80-Fold dilution of this concentrated aqueous solution with water affords a drinking water which, on administration to chickens which are infected with *E. tenella*, cures them of this infection. 20

#### EXAMPLE 5

25       28 Parts of paraquat dibromide, 28 parts of 3,5 - dinitrobenzamide and 44 parts of ground corn are thoroughly mixed in a blending machine. There is thus obtained a pre-mix which can be mixed in suitable proportions with poultry foodstuffs. The medicated foodstuffs thus obtained are suitable for feeding to poultry for the prophylactic control of coccidiosis. 25  
30

#### EXAMPLE 6

35       34 Parts of paraquat dimethosulphate, 22 parts of amprolium and 44 parts of wheat shorts are thoroughly mixed in a blending machine. There is thus obtained a pre-mix which can be mixed in suitable proportions with poultry foodstuffs. The medicated foodstuffs thus obtained are suitable for feeding to poultry for the prophylactic control of coccidiosis. 35  
30

#### EXAMPLE 7

40       30 Parts of the paraquat salt of sulphadimidine, 26 parts of 2-methyl-3,5-dinitrobenzamide and 44 parts of fuller's earth are thoroughly mixed in a blending machine. There is thus obtained a pre-mix which can be mixed in suitable proportions with poultry foodstuffs to produce a medicated foodstuff suitable for the prophylactic control of coccidiosis. 40

#### EXAMPLE 8

45       A solution of 1.88 parts of paraquat dichloride in 6.8 parts of water is added to a solution of 6.4 parts of the sodium salt of sulphadimidine in 50 parts of water. The resulting solution is adjusted to pH 9.5 by means of hydrochloric acid or sodium hydroxide solution, as appropriate. The resulting solution is made up to 100 parts with water, and there is thus obtained a concentrated aqueous solution which is suitable for the preparation of medicated drinking water. 320-Fold dilution of this concentrated aqueous solution with water affords a medicated drinking water which, on administration to chickens which are infected with *E. tenella*, cures them of this infection. 45  
50

#### EXAMPLE 9

55       13 Parts of the sodium salt of sulphadimidine are dissolved in a solution of 12.1 parts of paraquat dimethosulphate in 30 parts of water. 20 Parts of water are then added, and the solution is kept at ambient temperature for 16 hours. The resulting mixture is filtered and the solid residue is washed with 50 parts of ethanol. 1 Part of the solid is then stirred together with 15 parts of a 3:2 mixture of ethanol and water. The mixture is filtered, and the solid residue is washed with 5 parts of the abovementioned ethanol-water mixture, and is then dried. There is thus obtained the paraquat salt of sulphadimidine, m.p. 130°C. 55  
60

## EXAMPLE 10

A solution of 12.9 parts of paraquat dichloride in 23.3 parts of water is added to a solution of 30 parts of sulphaquinoxaline and 4 parts of sodium hydroxide in 100 parts of water. A black oil separates immediately. The supernatant aqueous solution is decanted from the oil, and the oil is dissolved in 100 parts of ethanol. The ethanol solution is stood at ambient temperature for 16 hours, during which time a crystalline solid separates out. The solid is filtered off, washed with ethanol, and dried. There is thus obtained the paraquat salts of sulphaquinoxaline, m.p. 151—153°C. with decomposition.

## EXAMPLE 11

The procedure described in Example 10 is repeated except that the sulphaquinoxaline is replaced by an equivalent amount of sulphathiazole. There is thus obtained the paraquat salt of sulphathiazole, m.p. 167—170°C.

## EXAMPLE 12

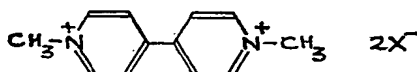
The procedure described in Example 10 is repeated except that the sulphaquinoxaline is replaced by an equivalent amount of *N* - 4' - acetylamino benzene - sulphonyl - 4 - nitroaniline. The oil which separates crystallises slowly. The solid is stirred together with methyl cyanide, the mixture is filtered, and the solid residue is dried. There is thus obtained the paraquat salt of *N* - 4' - acetylamino benzenesulphonyl - 4 - nitroaniline, m.p. 119°C.

The table below shows the percentage mortality and the average weight gain (in grams) of similar groups of infected chicks which were fed on the same starting poultry mash medicated with various concentrations of the paraquat salt of sulphaquinoxaline. Each treatment used 48 chicks, and the chicks were infected with 80,000 sporulated oocysts of *E. tenella* and treated with the medicated poultry mash for 7 days from the time of infection. The percentage mortality and average weight gain of the chicks were recorded at the end of this 7 day period.

Medication	Percentage of medication in mash (w/w)	Percentage mortality	Average weight gain per chick(g.)
None (non-infected chicks)	—	0.0	31.6
None (infected chicks)	—	83.4	6.9
Paraquat salt of sulphaquinoxaline	0.05	0.0	30.2
	0.025	0.0	34.0
	0.0125	6.3	28.1

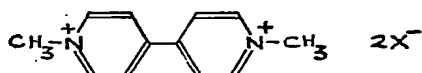
It is to be understood that in this specification we make no claim to solutions consisting of paraquat dichloride, paraquat dibromide or paraquat di-iodide dissolved in water, methanol, ethanol, aqueous ethanol or acetone, nor to a solution consisting of paraquat dimethosulphate dissolved in water. It is also to be understood that in this specification we make no claim to aqueous compositions containing only one active ingredient, and that selected from paraquat dichloride, paraquat dibromide, paraquat di-iodide and paraquat dimethosulphite, together with a wetting agent and/or a humectant. Subject to the foregoing disclaimer what we claim is:—

1. Veterinary compositions comprising one or more pyridine derivatives of the formula:—

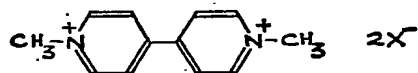


wherein  $\text{X}^-$  stands for an anion, together with an inert non-toxic diluent or carrier.

2. Compositions as claimed in claim 1 wherein  $X^-$  stands for a halide or metho-  
sulphate anion.
3. Compositions as claimed in claim 2 wherein  $X^-$  stands for a chloride, bro-  
mide or iodide anion.
- 5 4. Compositions as claimed in claim 1 wherein  $X^-$  is an anion derived from an 5  
anticoccidial sulphonamide derivative.
5. Compositions as claimed in claim 4 wherein  $X^-$  is the anion derived from  
sulphadimidine, sulphadiazine, sulphapyridine, sulphathiazole, sulphanilamide, sulpha-  
quinoxaline or *N* - 4' - acetylaminobenzenesulphonyl - 4 - nitroaniline.
- 10 6. Compositions as claimed in any one of claims 1—5 which are pre-mix com- 10  
positions or medicated animal foodstuffs and in which  $X^-$  stands for an anion derived  
from an anticoccidial sulphonamide derivative.
7. Pre-mix compositions as claimed in claim 6 which contain between 5 and  
70% w/w of the anticoccidial agent.
- 15 8. Medicated foodstuffs as claimed in claim 6 which contain between 0.01 and 15  
0.1% w/w of the anticoccidial agent.
9. Compositions of matter which consist of one or more pyridine derivatives of  
the formula:—



- 20 wherein  $X^-$  stands for an anion, and one or more known anticoccidial agents. 20
10. Veterinary compositions comprising one or more pyridine derivatives of the  
formula:—



- 25 wherein  $X^-$  stands for an anion, and one or more known anticoccidial agents, and an 25  
inert non-toxic diluent or carrier.
11. Compositions as claimed in claim 9 or 10 wherein the known anticoccidial  
agent is a known anticoccidial sulphonamide or a salt thereof, or 3,5-dinitrobenzamide,  
2-methyl-3,5-dinitrobenzamide or amprolium.
- 30 12. Compositions as claimed in claim 11 wherein the known anticoccidial agent 30  
is sulphadimidine, sulphadiazine, sulphapyridine, sulphathiazole, sulphanilamide, sul-  
phaquinoxaline or *N* - 4' - acetylaminobenzenesulphonyl - 4 - nitroaniline, or a salt  
thereof.
13. Compositions as claimed in claim 11 or 12 wherein the salt of the sulphon-  
amide is an alkali metal salt, alkaline earth metal salt or ammonium salt.
- 35 14. Compositions as claimed in claim 13 wherein the salt is a sodium, potassium 35  
calcium or barium salt.
15. Veterinary compositions as claimed in any one of claims 1—8 and 10—14  
which are in the form of aqueous solutions, solution tablets, pre-mix compositions or  
medicated foodstuffs.
- 40 16. A composition as claimed in claim 10 which is a concentrated aqueous solu- 40  
tion as defined hereinbefore.
17. An aqueous solution as claimed in claim 15 or 16 which contains a salt of a  
known anticoccidial sulphonamide derivative.
- 45 18. An aqueous solution as claimed in claim 17 which contains an alkali metal 45  
salt of sulphadimidine.
19. An aqueous solution as claimed in any one of claims 15—18 which contains  
a humectant and/or colouring agent.
20. An aqueous solution as claimed in any one of claims 15—19 which contains  
one or more corrosion inhibitors.
- 50 21. An aqueous solution as claimed in claim 20 which contains sodium nitrite 50  
and/or sodium metaborate.
22. A solution tablet as claimed in claim 15 which contains a salt of a known  
anticoccidial sulphonamide derivative.

23. A solution tablet as claimed in claim 22 in which the salt is an alkali metal salt.

24. A solution tablet as claimed in claim 15, 22 or 23 which contains one or more disintegrating agents, lubricating agents or inert fillers.

25. A solution tablet as claimed in claim 24 which contains one or more excipients selected from starch, vegetable gums, magnesium stearate, lactose and magnesium sulphate.

26. A concentrated aqueous solution as claimed in any one of claims 16—21 which contains between 0.5 and 7.5% w/w of paraquat and between 1.0 and 15% w/w of the anticoccidial sulphonamide derivative(s) or salt(s) thereof.

27. A solution tablet as claimed in any one of claims 15 and 22—25 which contains between 0.5 and 30% w/w of paraquat and between 1.0 and 60% w/w of the anticoccidial sulphonamide derivative(s) or salt(s) thereof.

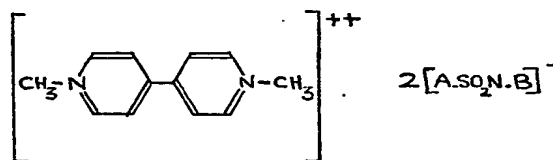
28. Pre-mix compositions as claimed in claim 15 which contain a solid, non-toxic diluent or carrier.

29. Pre-mix compositions as claimed in claim 28 in which the diluent or carrier is ground corn, corn distiller's dry grain, wheat shorts, corn cob meal, kaolin, talc, fuller's earth, calcium carbonate, attapulgus clay or ground oyster shells.

30. Pre-mix compositions as claimed in claim 15, 28 or 29 which contain between 2 and 20% w/w of paraquat and between 6 and 60% w/w of the anticoccidial sulphonamide derivative(s) or salt(s) thereof.

31. Medicated poultry foodstuffs as claimed in claim 15 which contain between 0.002 and 0.02% w/w of paraquat and between 0.006 and 0.06% w/w of the anticoccidial sulphonamide derivative(s) or salt(s) thereof.

32. Anticoccidial salts of the formula:—



wherein the anion  $[\text{A.SO}_2\text{N.B}]^-$  stands for the anion of an anticoccidial sulphonamide derivative.

33. A salt as claimed in claim 32 wherein the anion is derived from sulphadimidine, sulphaquinoxaline or sulphathiazole.

34. The paraquat salt of *N*-4'-acetylaminobenzenesulphonyl-4-nitroaniline.

35. A process for the manufacture of the salts claimed in claim 32 which comprises the interaction of a compound of the formula:—



wherein  $\text{Y}^-$  stands for an anion but excluding anions derived from sulphonamide derivatives, with a salt of an anticoccidial sulphonamide derivative but excluding paraquat salts thereof.

36. Process as claimed in claim 35 wherein  $\text{Y}^-$  stands for a halide or methosulphate anion.

37. Process as claimed in claim 36 wherein  $\text{Y}^-$  stands for the chloride, bromide or iodide anion.

38. Process as claimed in claim 35, 36 or 37 wherein the salt of the sulphonamide derivative is an alkali metal salt.

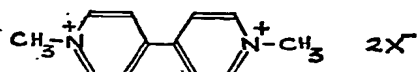
39. Process as claimed in claim 38 wherein the salt is a sodium or potassium salt.

40. Process as claimed in any one of claims 35—39 which is carried out in an inert diluent or solvent.

41. Process as claimed in claim 40 which is carried out in water.

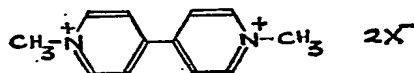
42. A process for the treatment of coccidiosis which comprises the oral administration to domestic animals of an appropriate amount of at least one pyridine derivative of the formula:—





wherein  $\text{X}^-$  stands for an anion.

- 5      43. A process for the treatment of coccidiosis which comprises the oral administration to domestic animals of appropriate amounts of at least one pyridine derivative of the formula: — 5



wherein  $\text{X}^-$  stands for an anion, and at least one known anticoccidial agent.

- 10      44. Veterinary composition, claimed in claim 1 or 10, substantially as described in Example 1 or 4. 10  
 45. Veterinary composition, claimed in claim 1 or 10, substantially as described in any one of Examples 2, 3 and 5—8.  
 46. Anticoccidial salt, claimed in claim 32, substantially as described in Example 9, 10 or 11.  
 15      47. Anticoccidial salt, claimed in claim 32, substantially as described in Example 12. 15  
 48. Process for the manufacture of anticoccidial salts, claimed in claim 35, substantially as described in any one of Examples 9—12.

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